

OBSERVATIONS ON THE
BIOLOGY, ECOLOGY, BEHAVIOR, AND LARVAE
OF *DRYOBIUS SEXNOTATUS* LINSLEY
(COLEOPTERA: CERAMBYCIDAE)¹

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ABSTRACT

Field observations, made over a period of 28 years on the biology, ecology, and behavior of *Dryobius sexnotatus* Linsley, indicate that larvae feed in *Ulmus*, *Fagus*, *Tilia americana* Linnaeus, or *Acer saccharum* Marshall for a period of 2-3 years. They seem to prefer standing overmature trees. The larva, described from 14 specimens taken from *Tilia* in Maryland, supports Linsley's suggested relationships between the Dryobiini and Callidiini. The range extends from Kansas, east to Maryland, south to Louisiana and north to Michigan; but 80% of the specimens are from the Ohio River Valley. The pseudoscorpion, *Parachelifer superbis* Hoff, was taken in a phoretic association with the adult beetle in Pennsylvania.

INTRODUCTION

Personal observations were made from 1946 to 1974 by R. W. Surdick on 3 isolated populations of *Dryobius sexnotatus* Linsley (Fig. 1) in southeastern Greene County, Pennsylvania. Data prior to 1946 was secured from entomologists who were lifelong residents of the area and who collected extensively there.

All 3 sites yielded adults in numbers while larvae were infrequently observed because of difficulty in extracting them from the host trees. However, some larvae were collected from large living, dying, or dead standing trunks of sugar maple (*Acer saccharum* Marshall), apparently the primary host here, although some were found on dead standing trunks of beech (*Fagus grandifolia* Ehrhart, F.), apparently a secondary host. It was taken on basswood (*Tilia americana* Linnaeus) in Maryland and eastern Virginia in 1920 and, we believe, it has been taken on elm (*Ulmus*) only once, reported by Say (1823).

BIOLOGY

In sugar maple, larvae work throughout the wood, especially deep into the heartwood, excavating large meandering galleries packed solid with fine-textured frass. Eventually the wood is so riddled that it becomes a solid mass of old galleries plugged with frass. Larvae continue to feed long after the tree has died and the bark has fallen off. The immature feeding period ranges from 2-3 years.

¹For Fig. 1, see cover of this issue.

Since several large larvae, dug out of sugar maple, were immediately below the surface and were either approaching or in the last instar, it is assumed that they work their way close to the surface for pupation. Teneral adults were taken from immediately beneath the loose bark of both sugar maple and beech. The workings in beech are much less extensive and closer to the surface than those in sugar maple, probably owing to the shorter durations of the standing dead trunks and the correspondingly lower number of beetle generations. Published host records are as follows: *Acer* (Siewers 1880, Dury 1902, Knull 1946, Linsley 1964), *Fagus* (Siewers 1880, Dury 1902, Knull 1946, Linsley 1964), *Tilia* (Knull 1946), *Tilia americana* (Linsley, 1964), *Ulmus* (Say 1823, Walsh & Riley 1869, Knull 1946, Linsley 1964).

DESCRIPTION OF LARVA

The following description (by D. M. Anderson) is based on a series of 14

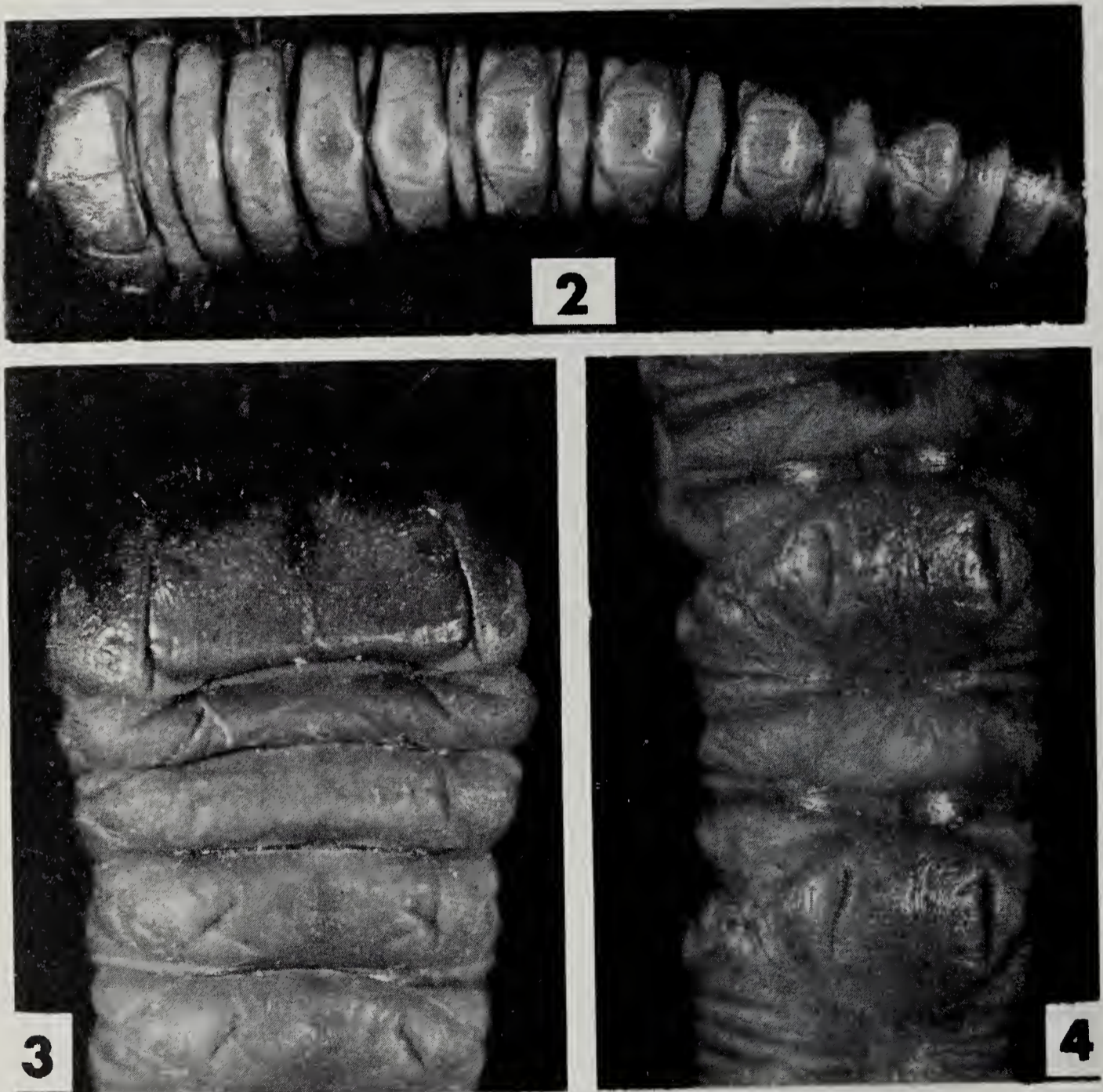


Fig. 2-4. *Dryobius sexnotatus* larva: 2) entire larva, dorsal view, actual length 32 mm (highlight on prothorax is unnaturally bright); 3) thorax and first 2 abdominal segments, dorsal view; 4) abdominal segments 5 and 6, dorsal view, showing ampullae.

larvae, of which 3 are apparently full grown, associated with a single adult in the collection of the U. S. National Museum of Natural History in Washington, D. C. The only collecting data with this series are "Maryland, *Tilia*, Hopkins U.S. No. 10635a.", but the labels with a pinned adult, bearing the same Hopkins number, indicate that the material was collected from *Tilia* on the Virginia-facing side of Plummers Island, Maryland (in the Potomac River) by H. S. Barber and F. C. Craighead, and that the rearing of the pinned specimen was completed on 16 July 1920. The technical terminology used here follows Duffy (1953).

With respect to subfamily characters, which are not included here, these larvae agree entirely with the characterizations of the Cerambycinae by Craighead (1923) and by Duffy (1953). They key to the tribe Callidiini in Craighead (1923), of interest because Linsley (1964) indicated that it is allied to the Callidiini on the basis of certain adult structures.

Maximum length: 32.0 mm; maximum width of prothorax: 7.7 mm. Form subcylindrical, slightly depressed across thorax, distinctly widest across prothorax (Fig. 2). Mandibles black, mouthframe piceous to reddish brown and broad enough at sides to narrowly enclose antennae; head capsule pale yellowish brown otherwise. Antennae of 3 distinct articles and salient, first article slightly longer than second. Genae sloping away from mouthframe; genal setae sparse and rather slender. Ocelli absent. Front margin of frons very dark and broadly emarginate. Hypostoma reddish brown, obliquely striate, distinctly emarginate at junction with submentum. Subfossal tubercle absent. Gula distinctly raised, its sutures diverging posteriorly. Mandibles faintly striate and bearing a shallow median longitudinal furrow on external surface. Process of maxillary palpifer distinct, not prominent. Second article of maxillary palpus slightly longer than first. Prothorax bearing 4 brownish dorsal plates behind anterior margin; opaque and sparsely punctate at sides; thinly clothed with yellowish-brown hairs on dorsolateral areas and on anterior half of the pronotum. Posterior third of pronotum less shining and darker than anterior half of the pronotum. Posterior third of pronotum less shining and darker than anterior portion, and finely reticulate, with median cleavage line raised (Fig. 3). Lateral furrows of pronotum distinct and deep (Fig. 3). Post-notal fold present behind pronotum (Fig. 3). Prosternum without a distinct eusternum. Legs distinctly 4-segmented, slightly longer than maxillary palpi. Dorsal and ventral ampullae of abdominal segments 1 to 7 rather prominent and (except on segment 7) without transverse furrows, but with distinct lateral furrows (Fig. 4); surface texture between lateral furrows longitudinally rugulose. Pleural discs distinct on abdominal segments 1 to 4, and depressed medially but without a sclerotized pit. Epipleurum distinctly more prominent on abdominal segments 7 and 8. Abdominal spiracles small, elliptical, without marginal chambers. Anal opening terminal, distinctly trilobed.

FLIGHT PERIOD

From collections and literature, we find the flight period ranges from 7 March to 7 September. However, most records (56.7%) are from 15 June to 15 July. Months and percentages of capture follow: March (1%), April (2.9%), May (1%), June (28.8%), July (57.6%), August (7.7%), September (1%). The males appear first and account for about 85% of the adult population (104 dated specimens consulted).

DISTRIBUTION

This species has been recorded from 14 states (Fig. 5): Alabama (Haldeman 1847, LeConte 1850, LeConte 1859); Arkansas (LeConte 1850, OSU); Indiana (Linsley 1964, CU, FMNH, MCZ); Kansas (OSU); Kentucky (Linsley 1964, USNM, RHP, CMNH, MCZ); Louisiana (MCZ); Maryland (Linsley 1964, USNM, MCZ); Michigan (Linsley 1964); Missouri (Say 1823, Linsley 1964, MCZ); Ohio (Haldeman 1847, LeConte 1859, Dury 1902, Knull 1946, Linsley 1964, USNM, CU, CMNH, CAS, MCZ OSU, CINC); Oklahoma (Linsley 1964); Pennsylvania (Linsley 1964, RHP, RWS, CMNH); Tennessee (Jamerson MS., USNM, CU); and Virginia (Linsley 1964, USNM). Over 80% of the specimens were taken in the Ohio River Valley. The primary host, *Acer saccharum*, occurred abundantly in this area which was noted for its sugar maple industry over 50 years ago. Drs. Wingo and Enns tell us (pers. comm.) that the type locality, Loutre Island in the Missouri River, "lies about 8 miles east of Herman, Missouri in Warren County."

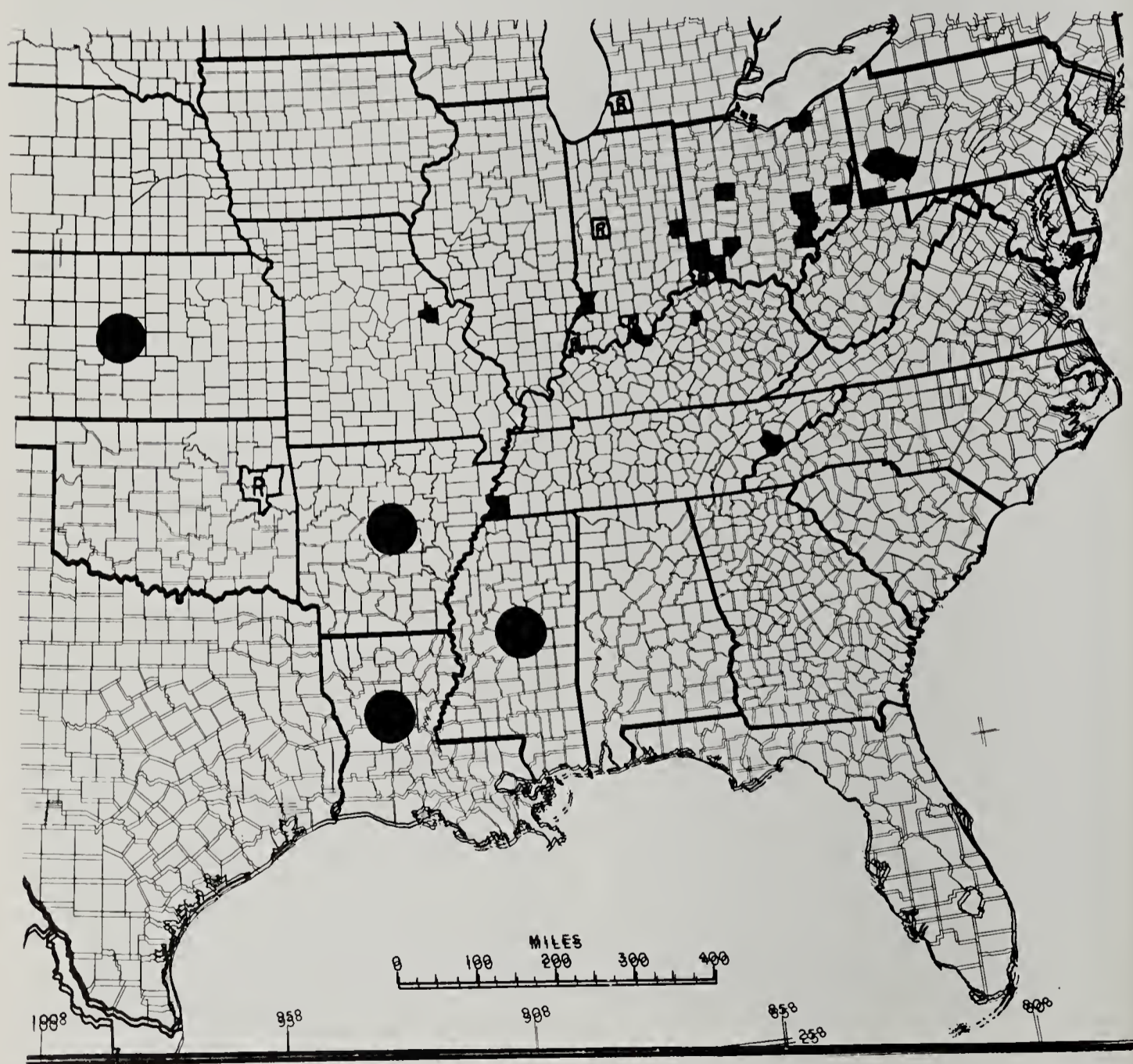


Fig. 5. Distribution of *Dryobius sexnotatus*: solid counties = specimens seen; R counties = recorded in literature but not examined by us; open circles = specimens with state data only.

PERSONAL OBSERVATIONS

In Pennsylvania, all of the sugar maples observed were very old trees, at least 3 feet across, and all had once been tapped for syrup. This occurred prior to 1930, since the trees examined in the early 1940's showed no evidence of recent tapping, with all scars well healed over.

The beetles have been collected walking on the surface and flying (rarely) about the standing trunks of large sugar maples, under the loose bark of sugar maples and beech and secreted in cavities at the base of sugar maples. When beech is the host, it is only the dead trees with solid lower trunks, that are attractive to the beetle, never those with hollow trunks. The vivid coloration of the beetles is much less discernible when observed in the dappled sunlight of the partially shaded habitat.

Most diurnal activity occurred from about noon to mid-afternoon in heavily wooded situations and from midmorning until late afternoon among host trees that were more exposed to sunshine. An adult male was observed emerging on 7 Aug 1974 at 3:45 PM. Only 3 adults were observed at dusk and none was observed fully exposed after dark (however, some were taken hidden in cavities after dark). In flight, they were seen only within several yards of the host trees.

Most sites are located in stream valleys where humidity is usually high. However, periods of excessive humidity appear to be either fatal to the larvae or inhibit emergence, because during the abnormally wet summer of 1972 only 3 adult beetles were collected, although our observations were continuous during their flight period. Mating activity was observed during periods of high temperature. Oviposition was not observed.

There have been only 3 occasions during R. W. Surdick's 28 years of observations when adults were collected on a fallen trunk. The 3 specimens, secured on 3 separate occasions (1973) at dusk, were on a severed end of a fallen sugar maple that fell the previous year. They were fully exposed but appeared to be seeking a suitable retreat for the night.

After much of the bark had either fallen off or been removed from the standing trees in search of the beetles, a method of collecting was initiated that produced good results. Large slabs of fallen bark were leaned against the base of the tree and these were then carefully removed at intervals and examined for adults. When present, the beetles were found clinging to the trunk, but never on the loose bark. Dury (1902) reported trapping them "... by nailing slabs of loose bark on the dead tree trunks", and Siewers (1880) stated "I tied the bark on ..."

Of the 3 populations observed in Greene County, Pennsylvania, 1 appears to be extinct or disappearing, no specimens having been collected there for several years. This small area, called Dark Hollow, retained an isolated active population of *Dryobius sexnotatus* on dead and dying mature beech trees until 1960. More recent searching, especially during the summers of 1970-1973, failed to produce any beetles or any indication of their presence, even though a suitable host still exists (beech). There had been a stand of sugar maple growing among the beech at one time, and speculation exists that it was the original host. Apparently beech maintained the population for a decade but could not support it indefinitely.

A second site on Whitely Creek contained several old sugar maples which maintained a population of beetles for many years. This grove was cut over long ago and somehow managed to be spared, possibly because the wood was

by then unsuitable for commercial purposes due to years of tapping. Successionally other hardwoods grew up and surrounded the few remaining old trunks which were still standing. Ultimately, a few beech began to die, and during the past few years these dead, standing trunks were host to a few *Dryobius sexnotatus*. However, few of the unsound beech remain, the trunks have fallen from natural decay as well as from the feeding of other larvae, principally *Bellamira scalaris* (Say) (Cerambycidae) and *Chalcophorella campestris* (Say) (Buprestidae). This area may support *Dryobius sexnotatus* for a few years since one old sugar maple with initial signs of infestation is still there.

The third site, Little Whitely Creek, also consists of an overgrown, former sugarmaking grove with remains of wooden structures used in the sugaring operation many years ago and a few old sugar maples that are slowly succumbing to the ravages of time. One standing dead trunk, a recently (1972) fallen tree, a partially dead trunk, and one healthy sugar maple are all that remain of the original 30-40 trees in this collecting site. Since beech never existed in or near this grove, over the period covered in this work, the population is assumed to be one of many continuous generations on sugar maple as a host.

PHORESIS

Eight specimens of the pseudoscorpion, *Parachelifer superbus* Hoff, were collected from adult beetles. This species has been recorded from Florida,

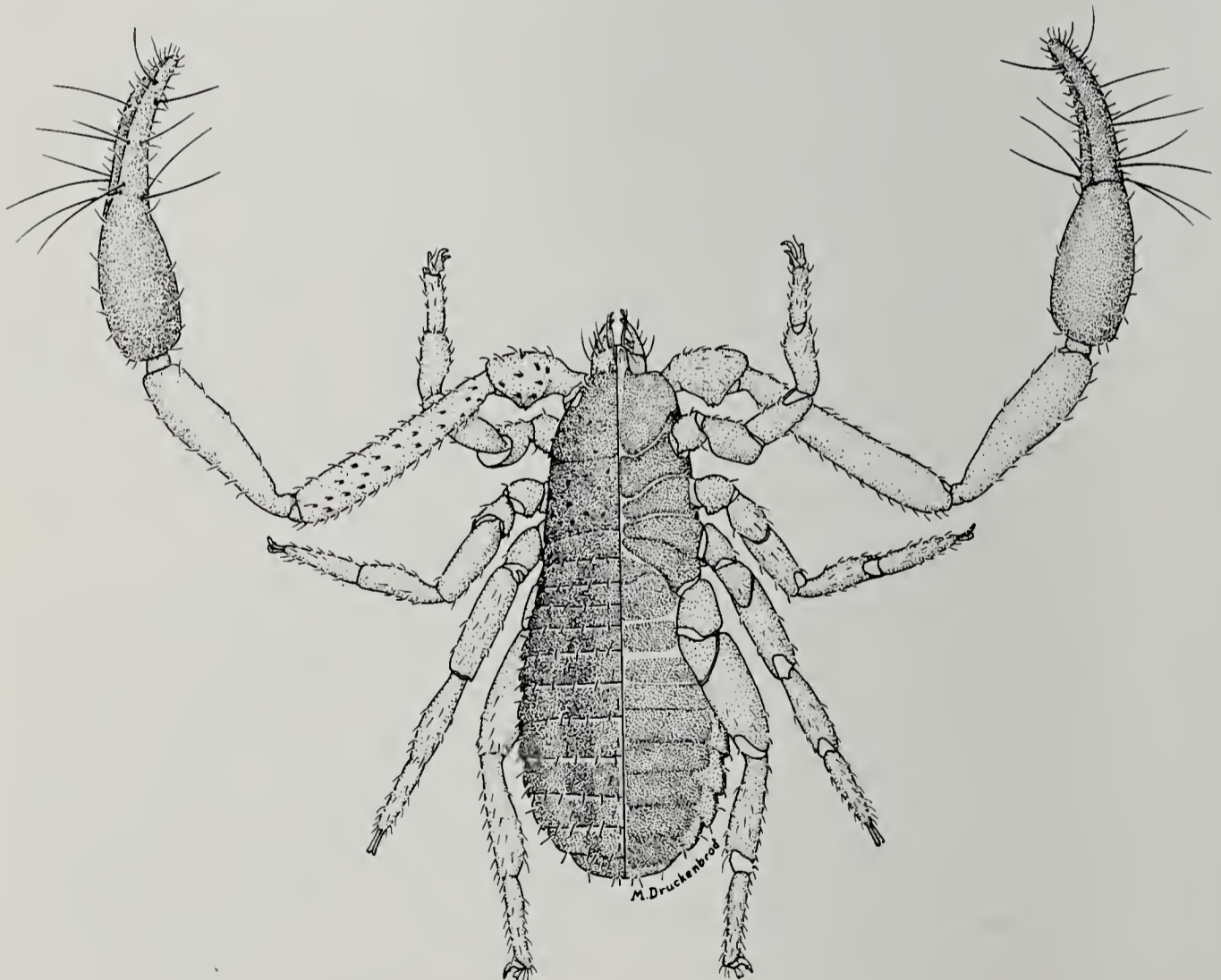


Fig. 6. *Parachelifer superbus* Hoff, male.

North Carolina, and Virginia; and this Pennsylvania material is a northern record. This species has been found almost exclusively associated with pines in Florida and North Carolina (although it has been taken on dead locust in Virginia by W. B. Muchmore). One pseudoscorpion was found on the dorsum of the abdomen under the wings. There appears to be a phoretic relationship between these 2 species in which the pseudoscorpion "hitchhikes" on the beetle from tree to tree. Muchmore (1971) discussed this phenomenon in greater detail. The pseudoscorpions are in the collection of R. W. Surdick (4), [FMNH] (1) [RHP] (1), and Rebecca F. Surdick (3).

SUMMARY

Dury (1902) noted that *Dryobius sexnotatus* was once abundant but was even then becoming rare. We have noted a sharp decline in the collection of this species since 1942 with the exception of the more than 110 specimens that R. W. Surdick and S. M. Gifford have taken since 1946 at the 3 previously mentioned localities in Greene County, Pennsylvania. This is 1 of the 3 counties where the species is still known to exist. Although *D. sexnotatus* can maintain itself on other hosts for a short period, its survival seems to depend on the availability of large, very old (overmature) sugar maple trees. These 3 counties still have some *Acer saccharum*, but the number of trees is diminishing and, so we believe, is the existence of *Dryobius sexnotatus*.

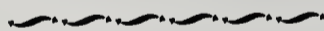
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BOOK REVIEW

Desert: The American Southwest (The Naturalist's America Series) 1973. Ruth Kirk. Houghton Mifflin Co., 2 Park St., Boston, Mass. 02107. \$10.00. 361 p., with 17 color and numerous black and white photos.

This beautiful volume is the 3rd in "The Naturalist's America Series" designed to treat the wildlife, plants, and geology of North America. Every beetle collector will find useful information as well as enjoyable reading in this thorough treatise.—R. E. Woodruff